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Genetic diseases and disorders

An Overview for Pediatric Dentists

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Introduction

The causes of human disease can be considered along a spectrum, ranging from conditions purely of genetic aetiology to those completely of environmental origin. Most diseases fall between these end points, thus an individual's genetic propensity or resistance and the environment in which they live determine whether disease occurs.[1] It can also be considered that "all diseases have a genetic component, either inherited or resulting from the body's response to environmental stresses like viruses or toxins".[2]

Genetic disease is defined as a disturbance in function or structure of any organ or part of the body caused by genes.[3] The disease associated gene, or genes, may be heritable (i.e. transmitted from parent to offspring) or a result of a spontaneous mutation. This paper will review current concepts of genetic diseases and disorders with particular reference to pediatric dentistry.

The Human Genome Project (HGP)

Commencing in 1990, the aims of the HGP are to identify all the genes coded in human DNA and sequence the entire human genomic code.[4] This collaboration of public and private sector research in many countries to map the genetic content of the human genome and other infectious microbes, animals and plants is publicly available on the internet (http://www.ncbi.nlm.nih.gov/genemap).[5]

The newfound knowledge of gene sequencing and further investigation into protein construction and cellular function creates bioengineering opportunities to significantly change the diagnosis, prevention and treatment of dental and medical diseases.[6] Genetic understanding of the molecular control of bone, periodontium, saliva and tooth development will lead to new methods of management away from surgical based approaches.[4] It has been suggested the repair and replacement of dental tissues by tissue bioengineering may become practice in the next 50 years.[6]

Online resources

Several online resources are available for clinicians to assist in diagnosis and management of genetic conditions. Online Mendelian Inheritance in Man (OMIM) is a database of information of inherited genetic disorders and genes available on the World Wide Web (http://www.ncbi.nlm.nih.gov/omim).[7-9] The National Centre for Biotechnology Information for the National Library of Medicine updates this site daily. OMIM provides a free full-text overview of genes and genetic phenotypes for students, researchers and clinicians.

Orphanet is a free European-based database of rare diseases (http://www.orpha.net/consor/cgi-bin/home.php?Lng=GB).

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REMINDER:
THE ANZSPD QLD BRANCH
WEEKEND CONFERENCE
23-25 NOVEMBER 2007
SUNSHINE COAST

Nina Vasan

President's Report

Here comes the first Presidential report from 'the mainland'.

Firstly, I would like to thank Drs John Winters and Alistair Devlin for leading the Society for the past three years. Both have made my role much easier as the Society is in good standing. I would also like to thank one of our principal founders, Dr Roger Hall for his prescience and determination to initiate ANZSPD. I feel proud to have been one of Dr Hall's students and am privileged to continue serving the Society he helped establish.

What a great time we had in Broome! My congratulations to the organising committee for putting together an excellent scientific and social programme. My family and I enjoyed learning how pearls are harvested, what the stars look like 18 degrees from the equator and how fast a Harley Davidson bike can travel in a 50km speed zone! There were many parts of the scientific programme which I gained valuable knowledge from. One of the highlights for me was the session presented by Drs Steve Singer and Mithran Goonewardene on the treatment planning for hypomineralised first permanent molars. Over the years, I am being referred increasing numbers of children with hypomineralised 6's for which treatment planning can be challenging. The practical principles presented by Steve and Mithran have simplified the treatment planning process for me.

About me (in a nutshell!)

I am a third generation New Zealand Indian. My father was born in New Zealand and went to India for an arranged marriage. He met mum briefly – i.e, he went to her house with his uncle, where she made him a cup of tea and his uncle then asked my father if he wanted to marry her (must have been a good cup of tea!). They have been happily married now for 41 years. Times have changed now and arranged marriages are less common.

I completed my undergraduate course at The University of Otago and had some fantastic years enjoying a unique student campus. Anyone who has lived in Dunedin will tell you the years at Otago Uni are some of the best years of their lives. My years there were further enriched as I met my future husband (Ellis) – and no, I didn't make him a cup of tea! We have two children, Shaquille (6) and Sasha (15 months).

After graduating in 1990, I worked as a House Surgeon at Auckland Hospital for three years, followed by four years private practice and a brief stint in the UK (I couldn't quite get a handle on the NHS and decided to travel and come back home). I went through the Paediatric Postgraduate Course in Melbourne where I met many of my Australian colleagues. Subsequently, I returned to Auckland in 1998 and worked at Middlemore and Greenlane hospitals and set up the first Specialist Paediatric private practice in New Zealand. My time at the hospital has reduced with increasing family and practice commitments.

The New Zealand context

There are some differences with our dental healthcare industry. By virtue of our smaller population we have fewer insurance providers. Although half the population have some form of health care insurance, there is minimal dental cover by their policies. This means that patients being seen in a private specialist practice pay full fees, including treatment under General Anaesthesia. There are no subsidies for any part of the dental, anaesthetic or theatre fees. I have been involved in lobbying two main private insurance companies to cover Paediatric Dentists for treatment under General Anaesthesia, as they do for Oral and Maxillofacial Surgeons. I have not had much success so far, primarily due to the limited number of Paediatric Dentists in NZ and our smaller population.

Accident Compensation Corporation (ACC) – is a government funded entity which subsidises healthcare treatment related to accidents. This includes medical, dental, psychological and physiotherapy care. Hence, if a seven year old falls and fractures a permanent incisor, any ongoing care for the lifetime of that tooth is subsidised (in select cases this can even involve future implants and prosthetics). Despite a few drawbacks, this system has been beneficial to many children who have sustained trauma.

School Dental Services – this government based initiative allows free treatment for preschool and school children by Dental Therapists. Children 13-18 years old at school can be treated by a dentist who holds a contract with their District Health Board to provide this care. However, the subsidies offered are nominal and many general dentists withdrew from this contract as their overheads for the patient were not even at break even point.

Government Policy – our government's primary healthcare policy of the day is the Primary Healthcare Strategy funding community-based entities to deliver population health based outcomes. It aims to ensure wider access to dental healthcare for those where it would otherwise not be affordable and care is not trauma-induced. These organisations require better representation of our profession at governance level and operationally for specific strategies to be formulated.

Other News

The New Zealand Dental Association (NZDA) incepted a prestigious new award in 2005 called 'Outstanding Young Dentist Award'. This involves a

dentist having graduated within the last 10 years who has contributed to dentistry in areas of clinical services, research, and shows leadership qualities. Previous publications, prizes and scholarships are also taken into account. Nominations are made by the local branches and a winner is selected by the NZDA. Congratulations to Dr Erin Mahoney, current recipient of this award. The inaugural winner in 2005-2007 was Dr Katie Ayers. Having two Paediatric Dentists win this award is fabulous demonstrating the outstanding calibre of these individuals and how fortunate we are that they have selected Paediatric Dentistry as their specialist vocation.

As I finish off, in the last few days many New Zealanders have been in shock and awe following a series of child abuse cases. The latest, a three year old girl from Rotorua was abused for several months ending with a torturous day, where she was pinned to a free standing clothes line, spun around violently and then placed in a tumble dryer! She was in a coma for several days at Auckland's Starship Hospital and sadly died today (2/8/07).

We are in a unique position seeing children daily through our work and have an obligation to be aware of signs/symptoms of child abuse which can affect any end of the social spectrum and culture. It is our responsibility to report our findings to the appropriate authorities. It is unbelievable what some adults will do to a defenceless child. Healthcare providers must maintain vigilance for suspicious symptoms.

On that note, I shall sign off and thank you all for your continual support. I look forward to catching up with you at different events.

Nina Vasan

Inaugural Clinical Tips

The eleven things I could not do without in paediatric dentistry

by Peter Gregory

1. Rubber Dam – having been in general dental practice for ten years prior to entering paediatric dentistry, where the use of rubber dam was only used for endodontics, the routine use of this clinical aid has had a most significant impact on the quality of restorative dentistry in my practice.
2. Compomers – the use of compomers in class I and class II carious lesions in primary teeth, with the accompanying elimination of amalgam from my clinical practice, has made an enormous contribution to the successful restoration of primary molars in my hands.
3. DVD Distraction – the use of DVD glasses and earphones when performing restorative dentistry in the dental surgery environment has dramatically decreased the number of behavioural issues that can occur with our child patients.
4. Orthodontic Separators – the use of orthodontic separators placed on the mesial aspect of hypoplastic six year old molars one week before their restoration with stainless steel crowns has immensely improved the ease of placement, and reduced the amount of tooth substance that needs to be removed prior to placement.
5. Electro-Surgical Pulpotomies – the use of electro-cautery to obtain haemostasis prior to the application of pulpotomy medicaments, has reduced the amount of medicament required and also the time involved in performing this procedure.
6. Fissure Sealants – the use of flowable composites instead of fissure sealant materials, has greatly increased the longevity of the sealants and almost eliminated to zero the number of top-ups required at subsequent visits.
7. Chlorhexidine Gel – the use of chlorhexidine gel following significant restorative treatment under general anaesthesia allows for quicker and better healing of the gingival tissues.
8. Dental Therapists and Hygienists – the use of chair side "hands on" dental auxiliaries has made my life extremely pleasant in that I can restrict myself to the more technical aspects of paediatric dentistry, allowing the more peripheral treatments to be performed by my auxiliaries.
9. Wooden Wedges – the routine use of wooden wedges placed interproximally between primary and permanent teeth allows sufficient separation to prevent, (in most cases), touching or nicking the adjacent pristine enamel in a class II situation.
10. T-band Matrices – despite the introduction of many different matrix systems, the original t-band (brass and stainless steel) in conjunction with wooden wedges, allows the placement of plastic restorative materials into class II situations, while still maintaining the correct contour of the marginal ridge, and provides a really tight contact point.
11. Nitrous Oxide – could not run a paediatric dental practice without this most important behavioural management tool.

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This site provides a description of each disease encompassing the genetic defect, incidence and prevalence, clinical signs and symptoms, current diagnostic tests and management recommendations. Orphanet also details current research projects, clinical trials, support groups and links to scientific literature.

Possum is a computer program available by subscription and designed to help clinicians diagnose syndromes (http://www.possum.net.au). This Australian-based tool has information on over 3,000 syndromes, chromosomal malformations, metabolic conditions and skeletal dysplasias. Clinical and radiologic features can be entered into the database to obtain differential diagnoses which can then be linked to OMIM.

Entrez Gene is an online gene-specific database that provides information on the location, sequence, protein interaction and expressions of genes (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?db=gene).[10-11] A number of other online resources are available (Table 1).

Genetic Principles

Aneuploidy is the term for a condition where the chromosome number of the cell is not the same number as the typical cell for that species.[12] Aneupoloidy is a relatively common chromosomal abnormality. Generally, autosomal aneuploidy has a profound negative effect on the physical and mental development of the affected individual. Aneuploidy involving the sex chromosomes has a less severe effect. An example of aneuploidy is a trisomy.

The most frequent trisomies are as follows: Down syndrome – trisomy 21; Edward syndrome – trisomy 18; and Patau syndrome – trisomy 13.[13] The sex aneuploides include Turner's syndrome (45 XO) and Kleinfelter syndrome (47, XXY). Down syndrome is a common genetic disorder, with an estimated prevalence of 1 in 1464 for mothers aged 20 years to 1 in 25 for mothers aged 45 years.[14]

Variation in chromosome structure may cause absence of a gene or cause changes in gene expression. This may be due to deletion, duplication or translocation mutation within a chromosome. It is important to note mutations do not always cause disease if the gene is able to create a functional, normal protein.

Deletion is a chromosome mutation involving loss of a segment of a chromosome. A break in a chromosome segment may occur anywhere along the length of the chromosome. The break may be induced by stressors such as heat, ionizing radiation, viruses, chemicals, transposable elements (mobile DNA segments) or errors in recombination. The consequence of deletion depends on the deleted genes in the segment of DNA. Deletion causing loss of the centromere (an important region in cellular division) will result in the loss of the entire chromosome from the genome. For example, Cri-du-chat syndrome is caused by the deletion of the short arm of chromosome 5. The deletion can vary in size from an extremely small part of the band at 5p15.2 to the entire short arm.[15] Prader-Willi syndrome is caused by a deletion of several genes at the locus 15q11-q13.[16]

A duplication mutation involves the doubling of a segment of chromosome. Duplication has played an important role in the evolution of gene families, such as the gene family for the haemoglobin protein, which is coded for in 13 genes on two chromosomes. Disease is generally not a feature.

Translocation is the change of position of chromosome segments and the gene sequences they contain. There is no net loss of DNA material. The translocation may occur wholly within a chromosome or between two or more chromosomes. Examples of disease caused by translocations are Burkitt's Lymphoma (translocations between chromosomes 8 and 14) and chronic myelogenous leukaemia (translocations between chromosomes 9 and 22).

Polygenic diseases are caused by multiple minor gene abnormalities which interact with environmental influences. These diseases have variable phenotypes dependant on the complicated interactions of numerous genes in each affected individual. Examples include diseases with complex aetiologies such as type 2 diabetes, mental illness, epilepsy, hypertension, cancer, arthritis, osteoporosis, birth defects such as spina bifida, cleft lip and palate and anencephaly, allergies and asthma.[17] Cancer is a complex disease currently being investigated worldwide. A number of genes have been implicated in cancer predilection including those involved with breast, ovarian, prostate, osteosarcoma and gastrointestinal cancers and skin melanoma and leukaemia. Further research is required to gain additional insights into the pathogenesis of cancers and other polygenic diseases.

Patterns of Mendelian Inheritance

Mendelian genetics in humans describes the pattern of inheritance of many human traits and diseases. A single gene disorder may be inherited in this manner. If the disorder is inherited in a dominant fashion the disease will be expressed in the presence of one "normal" chromosome and one "diseased" chromosome (heterozygous). A dominantly inherited disease may also be present in the homozygous state. In the case of a recessively inherited disease, both copies of the chromosome must be affected for the disease to manifest. A carrier is a person whose genome has one diseased gene and one normal gene; these individuals do not show signs or symptoms of the disease however have the potential to pass it to their offspring. The disease genes located on the X-chromosomes are called sex-linked disorders and are seen more often in males than females.

Autosomal dominant disorders are seen in multiple successive generations, each affected person has at least one affected parent. In this pattern of inheritance a disorder can be passed from father to son. Males and females are affected equally. Some autosomal disorders have variable penetrance – an individual may have the diseased gene and have very mild disease, or not even demonstrate any clinical features of the disease. Variable penetrance of these disease manifests as inconsistent clinical expression, which may even present with late age onset of clinical features. Some autosomal dominant conditions in the homozygous state may be lethal.

Examples of autosomal dominant disorders that may be seen by pediatric dentists include achondroplasia (full penetrance), polydactyly, Huntington syndrome, Marfan syndrome (variable penetrance), Ehler-Danlos syndrome, some of the amelogenesis imperfecta variants, all types of osteogenesis imperfecta (wide expressivity), neurofibromatosis type I (phenotypic variability), von Willebrand disease and cleidocranial dysplasia.[18]

Autosomal recessive disorders feature one or more affected children

with unaffected parents. Higher incidences are seen in consanguinity. Males and females are equally affected. Both parents must be carriers of the recessive gene to produce a child with a homozygous recessive disease. Their chance of producing normal offspring is 25%, a heterozygous carrier is 50% and a homozygous affected child is 25%. In small families these disorders may be diagnosed as a spontaneous mutation. Clinical signs and symptoms are often seen in the neonate, infant or during early childhood. Autosomal recessive diseases may be more common in certain ethnic groups.

Examples of autosomal recessive disorders include sickle cell anaemia, thalassaemia, haemochromatosis, cystic fibrosis, non-syndromic sensory deafness, albinism, some forms of amelogenesis imperfecta and osteopetrosis, Tay-Sachs disease, Usher syndrome and Hurler's syndrome.[18,19]

The X-linked disorders are carried on the sex chromosome - a woman has two copies of the X gene, whilst men have only one copy. X-linked dominant disorders show expression in females and males. Often X-linked dominant disorders are lethal in males. A pedigree of these traits may show numerous miscarriages and no male to male transmission. The X-linked dominant disorders are rare.

An example of an X-linked dominant disorder is incontinentia pigmenti. This condition is usually lethal prenatally in males. Affected females show highly variable abnormalities of skin, hair, nails, teeth, eyes and central nervous system. Females with this disorder demonstrate perinatal skin blisters which spontaneously resolve with time to become a marbled brown or grey pigmentation that fades into hypopigmented macules and dermal scarring in adulthood.[20]

The X-linked recessive disorders are more common than their dominant counterparts. If a woman has a disease gene on one X chromosome and the second X chromosome is disease free, she will generally not display the phenotypic effects of disease. A male with the diseased X chromosome will demonstrate the clinical signs and symptoms of disease, as the corresponding chromosome pair is the Y chromosome. This is seen within families, with sisters demonstrating none or mild signs of disease and brothers markedly more affected. The X-linked disorders generally only present in males, affecting more than one generation involved with the females seemingly uninvolved. These diseases are not passed from father to son. A female carrier of some X-linked recessive disorders (generally those involve enzymatic defects) may show mild clinical symptoms not requiring treatment.

Examples of X-linked recessive disorders include Fragile X syndrome, Hemophilia A and B, vitamin D deficient rickets (X-linked hypophosphatemia), Hunter syndrome and orofacial digital syndrome.

Syndromes and Sequences

A syndrome is a group of features (traits) occurring in a consistent pattern arising from a common often unknown cause. A sequence is a group of abnormalities caused by a "cascade" of events beginning with one malformation (e.g. Pierre Robin sequence). The genetic basis of Pierre Robin sequence is unknown, however mutation of genes involving coding or regulation of collagen have been implicated.[21]

Thousands of syndromes have been identified that may be a result of inheritance or spontaneous mutation. Resources such as OMIM, Possum, Orphanet, and texts such as Hall's *Pediatric Orofacial Medicine and Pathology for the clinician*[22] and Gorlin's *Syndromes of the Head and Neck*[23] provide comprehensive starting points to obtain information on various syndromes.

Pathophysiology of Genetic Disease

The pathophysiology of genetic disease is related to the genetic defect of DNA. The altered DNA will transcribe a different amino acid, which in course changes the structure of the protein produced. The altered protein has different physical properties, thus is unable to fulfill the intended role. The effect of the altered or diseased protein will depend on the function of the original protein and the capacity of the altered protein substitute. In addition, the effect of the altered protein may change other chemical pathways in the body, or may not be able to be removed adequately by the body (i.e. excess production with limited excretion of a protein).

Each genetic mutation or disease causes a change in protein production, thus the pathophysiology of each diseased gene is unique. In addition, differing penetrance of a disease causes variation within disease expression between individuals. The affected protein may manifest as a single system or multisystem defect.

Medical management of genetic diseases and disorders

Diagnosis of genetic disorders can be made pre- or postnatally. The family history can identify high risk individuals for many inherited diseases. A pedigree should be constructed when considering the pattern of inheritance of a suspected or known disease. This may be done by any health professional, including pediatric dentists. Once an appropriate family pedigree has been obtained, referral to a clinical geneticist may be warranted, if the family wish to investigate the disorder further.[24] A diagnosis of a disease can prevent unnecessary medical visits or tests, provide information regarding prognosis for doctors and families, recognise complications which may occur over time, allow timely interventions where appropriate and allow the family to seek support.

There are over 500 prenatal genetic tests currently available.[25] Prenatal testing for single gene disorders is available for many disorders and routinely undertaken for Down syndrome and cystic fibrosis in many countries.[13,24] A recent retrospective cohort study reported the risk of loss of the foetus due to testing was less than 0.83% for amniocentesis and 3.12% for chorionic villus sampling at an American medical institution.[26] DNA obtained from tissue samples can be analysed by polymerase chain reaction. Fluorescence in situ hybridisation (FISH) is a commonly-used tool for prenatal diagnosis of aneuploidies and structural chromosome abnormalities. The FISH technique is a relatively inexpensive tool although it is limited by an inability to detect deletions or translocations which require traditional cytogenetic methods.

The cost of prenatal testing to the health system is significant and expansion of broad genetic screening to other disorders such as spinal muscular dystrophy and fragile X syndrome is being considered by some governments. Ethnic-based screening for certain populations which are high risk for various genetic diseases, such

as the Ashkenazi Jewish population, is offered in some countries.[24]

An accurate family tree should be obtained collecting information about as many family members as possible. This should detail dates of birth, dates and cause of death, the number of children, including miscarriages, terminations and any specific medical diagnosis. If elective pregnancy terminations are reported, it should be noted whether there were any medical reasons. Apparent infertility of any individuals may also be important when analysing a pedigree. Photographs may be of value to a clinical geneticist when constructing a pedigree. The main purposes of this exercise are to aid determination of the mode of inheritance and identify individuals who may be at risk.

A uniform standard of pedigree symbols has been set by The Pedigree Standardisation Task Force.[27] Females are symbolised by circles and males by squares. Individuals with the trait are marked as solid figures. The offspring are recorded in order of birth from left to right.

Genetic counselling has been defined as a process by which patients or relatives at risk of a heritable disorder are advised of the consequences of the disorder, the probability of developing or transmitting it and the ways in which this may be prevented, avoided or ameliorated.

The aims of genetic counselling are to help the family:[28]

1. Comprehend the medical facts, including diagnosis, prognosis and treatment,
2. Appreciate the way heredity contributes to the probable cause of the disorder and the available management,
3. Understand the alternatives for dealing with risk of recurrence,
4. Choose a course of action which is to them, appropriate with respect to any risks, and
5. Make the best possible adjustment to the disorder where a family member is affected.

Referral to a genetic counselor can be made by pediatric dentists after discussion with the parents. A genetic counselor will construct a pedigree and analyse this for genetic and birth defect risk. The process provides an opportunity for the family to discuss the nature of the disease/s for which they are at risk and the options available to reduce the risk of recurrence. Appropriate cytogenetic and medical testing may be ordered by the geneticist. Subsequent supportive counselling may be necessary to support the family with their newfound knowledge.

Dental management of genetic diseases and disorders

The dental management of genetic disease and disorders is complex. For a known disorder, a thorough medical history including treatments provided should be obtained. The medical condition of the patient may have implications for the patient's diet, manual dexterity and overall health or immune system function. There may be contraindications for some dental treatments such as general anaesthesia management, pulp treatment or extraction of teeth. The management of polygenic dental disease such as salivary dysfunction, cleft lip and palate and periodontitis is likely to shift to regenerative techniques with the advent of new therapeutic advances.[6]

In the situation where a disorder is undiagnosed, a complete medical history should be taken. Any suspicions regarding a health related issue should be discussed with the parents and referral to the child's physician or paediatrician for further investigation. Many syndromes and other diseases have dental anomalies, which may have been overlooked by other health professionals.

The future of genetics in dental practice is an area with potential growth. The transfer of knowledge obtained from the HGP to the dental surgery will occur in the foreseeable future. Dental care of the future will rely increasingly on genetic testing to identify genetic variants that affect disease risk and susceptibility. At present genes for several tooth-related disorders such as amelogenesis imperfecta, dentinogenesis imperfecta, tricho-dento-osseous syndrome, ectodermal dysplasia, cleidocraniofacial dysplasia, Witkop syndrome, hereditary gingival fibromatosis, Papillon Lefevre syndrome, hypodontia and oligodontia have been identified.[29]

As this technology progresses, the profession will need to consider the ethical, legal and social implications. Informed consent, privacy and confidentiality and the potential for discrimination may become issues or barriers to care. The dental profession will require ongoing education regarding incorporation of genetic knowledge, statistics and epidemiology with ethical and social aspects which may be unique to genomic medicine. Genetic training is conventionally a very small component of undergraduate dental teaching. As this aspect of healthcare grows, dental education facilities will need to integrate this with traditional curricula.[6,29]

Conclusion

The advent of genomic medicine holds great promise for medicine. The current gap in knowledge between diagnosis and management will become smaller with genomic-based technology. As pediatric dentists, a large number of medically-compromised patients rely on our care. A thorough understanding of the inheritance of disease and the risks, morbidity and prognosis of a patient's disease gives us as dental practitioners a realistic base on which to tailor preventive, treatment and overall management plans.

References

1. Hemminki K, Lorenzo-Bermejo J, Försti A. The balance between heritable and environmental aetiology of human disease. Nature 2006;7:958-65.
2. Oak Ridge National Laboratory. Medicine and the new genetics: diagnosing and predicting disease and disease susceptibility. Accessed 2007 11 July; Available from: http://www.ornl.gov/sci/techresources/Human_Genome/medicine/medicine.shtml
3. Blakiston's Illustrated Pocket Medical Dictionary. 2nd ed, ed. Hoerr N, Osol A., Chase S, Francis C. 1960: McGraw-Hill Book Company, Inc.
4. Wright J, Hart TC. The Genome Projects: Implications for dental practice and education. J Dent Educ 2002;66:659-71.
5. Slavkin H. The Human Genome, Implications for Oral Health and Disease, and Dental Education. J Dent Educ 2001;65:464-79.
6. Yeager A. Where will the genome lead us? JADA 2001;132:801-7.
7. Hamosh A, Scott AF, Amberger J, Valle D, McKusick VA. Online Mendelian Inheritance in Man (OMIM). Human Mutation, 2000;15:57-61.
8. Hamosh A, Scott AF, Amberger J, Bocchini C, Valle D, McKusick VA. Online Mendelian Inheritance in Man (OMIM), a knowledgebase of human genes and genetic disorders. Nucleic Acids Res 2002;30:52-5.
9. McKusick V. Mendelian Inheritance in Man and Its online version, OMIM. Am J Human Genetics, 2007;80:588-604.
10. Maglott D, Ostell J, Pruitt KD, Tatusova T. Entrez Gene: gene-centred infromation at NCBI. Nucleic Acids Res 2007;35(Database issue):D26-31.

11. Deloukas P, Schuler GD, Gyapay,G., Beasley,E.M., Soderlund,C., Rodriguez-Tomé,P., Hui,L., Matise,T.C., MuKusick,K.B., Beckmann,J.S. Bentolila S, Bihoreau M, Birren BB, Browne J, Butler A, Castle AB, Chiannilkulchai N, Clee C, Day PJ, Dehejia A, Dibling T, Drouot N, Duprat S, Fizames C, Fox S, Gelling S, Green L, Harrison P, Hocking R, Holloway E, Hunt S, Keil S, Lijnzaad P, Louis-Dit-Sully C, Ma J, Mendis A, Miller J, Morissette J, Muselet D, Nusbaum HC, Peck A, Rozen S, Simon D, Slonim DK, Staples R, Stein LD, Stewart EA, Suchard MA, Thangarajah T, Vega-Czarny N, Webber C, Wu X, Hudson J, Auffray C, Nomura N, Sikela JM, Polymeropoulos MH, James MR, Lander ES, Hudson TJ, Myers RM, Cox DR, Weissenbach J, Boguski MS, Bentley DR. A physical map of 30 000 human genes. Science 1998;282:744-6.
12. King R, Stansfield W. A dictionary of genetics. Sixth ed. 2002, New York: Oxford University Press.
13. Spencer K. Aneuploidy screening in the first trimester. Am J Med Genet Part C Semin Med Genet 2007;145C:18-22.
14. Bray I, Wright D, Davis C, Hook E. Joint estimation of Down syndrome risk and ascertainment rates: a meta-analysis of nine published data sets. Prenat Diagn 1998;18:9-20.
15. OMIM, http://www.ncbi.nlm.nih.gov/entrez/dispomim.cgi?id=123450. 2007, John Hopkins University. Accessed 21 July 2007.
16. OMIM, http://www.ncbi.nlm.nih.gov/entrez/dispomim.cgi?id=176270. 2007, John Hopkins University.
17. Cookson W, Moffatt MF. Genetics of asthma and allergic disease. Hum Mol Genet 2000;9:2359-64.
18. OMIM, http://www.ncbi.nlm.nih.gov/sites/entrez?db=OMIM. 2007, John Hopkins University.
19. Mensink K, Hand J. Autosomal recessive inheritance: an updated review. Ped Derm 2006;23:404-9.
20. OMIM, Incontinentia pigmenti – http://www.ncbi.nlm.nih.gov/entrez/dispomim.cgi?id=308300. 2007, John Hopkins University.
21. Jakobsen L, Ullmann R, Christensen S, et al. Pierre Robin sequence may be caused by dysregulation of SOX9 and KCNJ2. J Med Genet 2007;44:381-6.
22. Hall R. Pediatric Orofacial Medicine and Pathology. London: Chapman and Hall Medical; 1994.
23. Gorlin RJ, Cohen MM, Levin LS. Syndromes of the Head and Neck, Third Ed. Oxford: Oxford University Press; 1990.
24. Roe A, Shur N. From new screens to discovered genes: the successful past and promising present of single gene disorders. Am J Med Genet Part C Semin Med Genet 2007;145C:77-86.
25. Ekberg M. Maximizing the benefits and minimizing the risks associated with prenatal genetic testing. Health, Risk and Society, 2007;9:67-81.
26. Caughey A, Hopkins L, Norton M. Chorionic villus sampling compared with amniocentesis and the difference in the rate of pregnancy loss. Obstet Gynecol 2006;108:612-6.
27. Bennett R, Steinhaus KA, Uhrich SB, O'Sullivan CK, Resta RG, Lochner-Doyle D, Markel DS, Vincent V, Hamanishi J. Recommendations for standardized pedigree nomenclature. J Genetic Counsel 1995;4:267-79.
28. American Society of Human Genetics Ad Hoc Committee on Genetic Counselling: Genetic Counselling: Am J Hum Genet 1975;27:240-2.
29. Gettig E, Hart T. Genetics in dental practice: social and ethical issues surrounding genetic testing. J Dent Educ 2003;67:549-62.

Table 1: Online Genome Resources

Online Mendelian Inheritance in Man (OMIM)	www.ncbi.nlm.nih.gov/omim
Orphanet	www.orpha.net/consor/cgi-bin/home.php?Lng=GB
Human Genome News	genomics.energy.gov/
National Coalition of Health Professional Education in Genetics	www.nchpeg.org
American Society of Human Genetics	www.faseb.org/genetics
Nature	www.nature.com/nature/index.html
New England Journal of Medicine	content.nejm.org/
British Medical Journal	bmj.com
The Scientist	www.the-scientist.com
New York Times (Science)	www.nytimes.com/pages/science/index.html
DOE Joint Genome Institute	www.jgi.doe.gov
Virtual Library on Genetics	www.ornl.gov/sci/techresources/Human_Genome/genetics.shtml
The Sanger Centre	www.sanger.ac.uk
The Jackson Library	www.jax.org
Washington University Genome Sequencing Centre	www.genome.wustl.edu
The Broad Institute	www.broad.mit.edu/
European Bioinformatics Institute	www.ebi.ac.uk
The Genome Database	gdbwww.gdb.org
Journal of the American Medical Association	jama.ama-assn.org
Stanford Human Genome Centre	www-shgc.stanford.edu
The University of Michigan DNA Sequencing Core	seqcore.brcf.med.umich.edu
Wellcome Trust Centre for Human Genetics	www.well.ox.ac.uk

Adapted from:

1. Slavkin H. The Human Genome, Implications for Oral Health and Disease, and Dental Education. J Dent Educ 2001;65(5):464-79.
2. Yeager A. Where will the genome lead us? JADA 2001;132:801-7.

Who are our postgrads and what are they up to?

The University of Melbourne
Doctor of Clinical Dentistry (Pediatric Dentistry)
Postgraduate students 2007

FIRST YEAR

Dr Narisha Chalwa
BDS Melbourne 2004

Research Title: Distribution and Putative Associations of Molar Hypomineralisation and Molar Incisor Hypomineralisation

Abstract: Epidemiological studies and clinical reports suggest that molar hypomineralisation (MH) and molar incisor hypomineralisation (MIH) are increasing in prevalence.

Aim: To determine the distributions of first permanent molars (FPMs) affected by MIH and MH, and associations between medical and perinatal factors and presence of MIH and MH.

Method: Children with MIH or MH were identified by a paediatric dentist in Melbourne. A questionnaire regarding medical and perinatal histories was sent to their parents/guardians. These clinical records were reviewed. Six putative medical risk factors (antibiotics, chicken pox, ear infection, fever, perinatal conditions, other medical factors) were studied in histories to age three years. Treatment of FPMs was examined, recording the most invasive procedure per dentition.

Dr Amy Fung
BDS Melbourne 2002

Research Title: The prevalence of erosive tooth wear and associated risk factors in primary school children in Melbourne

Rationale: Tooth wear is defined as the loss of mineralised tooth substance as a result of physical and or chemical attack. This may include attrition, abrasion, abfraction or erosion. It is most likely that these processes co-exists, however, in children and adolescents, erosion is the most predominant cause of tooth wear. To date, the evaluation of dental erosion in children has been largely confined to UK and Europe. Anecdotally, there have been reports suggesting that the prevalence of dental erosion is increasing which may be attributed to lifestyle and dietary changes over the past few decades.

Study Aims: Using a cross sectional and questionnaire-based approach, this research aims to measure the prevalence of dental erosion in primary school aged children in metropolitan Melbourne and to investigate current patterns of consumption of potentially tooth erosive beverages, fruits and foods in primary school aged children in metropolitan Melbourne.

Study Objectives: To determine the severity and distribution of erosive lesions in the sample population and to investigate whether there is an association between the prevalence of erosion and dietary habits, oral hygiene behaviors, systemic diseases or medications.

SECOND YEAR

Dr Badrun Nafis
BDS Singapore 2000

Research Title: The effect of Kappazinc™ on acid production of Streptococcus Mutans

Study Aims: The aims of this study are as follows: 1) To investigate the effect of different concentrations of Kappacin and KappaZinc™ on acid production of Streptococcus Mutans (SM) at different pH levels; 2) To determine the optimal concentration of Kappacin and KappaZinc™ that will inhibit the acid production of SM at different pH levels.

Expected Outcomes: Achieving the aforementioned aims will enable improved recognition of the effects of the antimicrobial peptides Kappacin and KappaZinc™ on SM. The antibacterial properties and mechanisms of the peptides will be better understood. This may have potential for use of the peptides in food and oral care products to help lower dental caries risk.

Dr Jane Lee
BDS Adelaide 2003

Research Title: Can children's caries patterns be correlated with fluid intake?

Study Aims: To determine: (1) the fluid intake of low, moderate, and high risk children in a sample population using

a modified Pediatric Risk Assessment Questionnaire Tool (PRAT); (2) the caries risk of the children using the modified Caries-risk Clinical Assessment Tool (CAT); (3) the prevalence of low, moderate, and high caries risk children in the sample; and (4) associations between caries experience and fluid intake.

Study Design: A cross sectional, convenience study of primary school children (6-12 yrs) attending the RDHM will be conducted using the PRAT and CAT. Two groups will be studied: Group I parents will be asked to complete the PRAT only; Group II parents will complete the PRAT and the primary investigator will complete the CAT. Children included will be healthy, reside in metropolitan Melbourne and have parental consent to participate. Excluded will be children with medical compromise, dental abnormalities or those whose parents cannot complete the PRAT.

Expected Outcomes: This project will provide insights into the current fluid intakes of children with or without caries and will examine putative associations. New health promotion recommendations may evolve from possible identification of risk markers.

THIRD YEAR

Dr Asmaa Othman Alkhatib
BDS Sudan 2000

Research Title: An investigation of the effect of some commercial bleaching agents on the microhardness of human enamel and the effect of a new tooth crème (Tooth Mousse™) on the microhardness of bleached enamel.

Abstract: Research has demonstrated that bleaching materials affect the mechanical properties of tooth enamel, including hardness. These agents cause mineral loss from enamel. The most common adverse effect of applying bleaching materials to teeth is tooth sensitivity. The active ingredient in a new tooth crème, Tooth Mousse™, is based on a product derived from casein, the major protein from milk. Tooth Mousse™ is rich in calcium and phosphate and helps prevent tooth sensitivity. Extracted permanent (human) third molars will be used to test the effect of bleaching materials on enamel hardness and to determine the effect of Tooth Mousse™ on bleached enamel. Enamel hardness will be measured using nanoindater, an ultramicrohardness instrument. If bleaching materials are found to decrease enamel hardness and that Tooth Mousse™ can reverse this effect, the use of Tooth Mousse™ in conjunction with tooth whitening will be recommended.

Dr Fiona Ng
BDSc (Hons) WA 2002

Research Title: An evidence-based assessment of four primary molar pulpotomy medicaments.

Abstract: The principles of evidence-based dentistry were used to compare mineral trioxide aggregate (MTA), formocresol (FC), ferric sulfate (FS) and calcium hydroxide (CH) as primary molar pulpotomy medicaments.

Methods: Electronic databases were searched (1966 to October 2005) and sieved for relevant papers by examining titles, abstracts and finally full texts. Included were randomized clinical trials (RCTs) and clinical trials (CTs) comparing the clinical and radiographic successes of MTA, FC, FS and CH pulpotomies. Data were extracted and common odds ratios (CORs) were derived by fixed effects meta-analysis (direct or indirect MA). Mean clinical and radiographic success rates from relevant study arms were examined.

Dr Nymphia Malhotra
BDS Otago NZ 2000

Research Title: An *in vitro* investigation into the effect of fluoride and Casein Phosphopeptide – Amorphous Calcium Phosphate (CPP-ACP) on laboratory created and natural white spot enamel lesions in deciduous enamel.

Aims: This *in vitro* study aimed to quantify the effectiveness of remineralisation of laboratory-created enamel sub-surface lesions (ESL) and natural white spot lesions (WSL) of primary enamel after the application of Tooth Mousse (TM) (10% CPP-ACP w/v), Tooth Mousse Plus (TM+) (10% CPP-ACP w/v, 900ppm NaF) and fluoridated toothpaste (FTP) (1000ppm F) using quantitative light-induced fluorescence (QLF) and digital photographic imagery (DP).

Materials and Methods: Ethical approval was obtained from the HREC University of Melbourne. Specimens with WSL or for ESL creation were sectioned from either buccal or lingual surfaces of otherwise sound extracted primary molar teeth stored in 10% neutral buffered formalin. The ESL of approximately 100μm depth were created using the Carbopol method. The WSL were sectioned into test and control half-slabs; the control ESL areas were covered with acid resistant nail varnish. The ESL and WSL test specimens were exposed to remineralising solutions containing artificial saliva and either TM, TM+ or TP. Baseline and endpoint QLF and DP images were captured under standardized lighting and desiccation conditions and $\triangle$F, $\triangle$Q and CIELAB L*a*b* values were determined using QLF or Photoshop CS software respectively. The baseline and endpoint QLF and DP data for each test group were analysed and compared using SPSS (Version 14), and the relationship between QLF and DP data on mineral loss/content was examined.

ANZSPD Federal Secretary-Manager's Report

The Federal Council, with the generous financial assistance of Colgate Oral Care, instigated the R.K. Hall International Visiting Lecturer program in the late 1990s. The idea was to have an eminent international lecturer tour and visit half of the ANZSPD branches in the year immediately following the Society Convention. Further, the opportunity was taken to honour the Foundation President of the Australian Society of Dentistry for Children, A.N.Z.S.P.D. Life Member and a past President of the International Association of Paediatric Dentistry, our own Dr Roger Hall. In 2008, the branches to be visited will be New Zealand, Victoria and New South Wales, and through the kind agencies of Dr Sam Gue, we have been extremely fortunate to have secured Professor David Kenny as the 2008 R.K. Hall International Visiting Lecturer.

Professor Kenny is the Professor of Dentistry at the University of Toronto; Director of the Cleft Lip and Palate/Craniofacial Dental Program and Senior Associate Scientist, Research Institute at the Hospital for Sick Children in Toronto, Canada. He is acknowledged as one of the world authorities in the field of dental trauma. The dates for his R.K. Hall 2008 Tour have now been confirmed, and he will be giving one day courses as follows:

Sydney, Friday, 8 February 2008

Melbourne, Saturday, 1 March 2008

Dunedin, Monday, 3 March 2008

Wellington, Friday, 7 March 2008

All ANZSPD members will be receiving a brochure for the tour, but this early notice might allow you to mark your diaries, and in the case of members not from New Zealand, New South Wales or Victoria, to give some thought to making a visit to one of the centres where Professor Kenny will be speaking. I am sure you will not be disappointed.

Alistair Devlin

Branch News

Western Australia

Those members of the Society who have been involved in the organising of a Federal Convention will probably be aware of the 'post-Convention hangover'. The Conventions are years in the planning and organisation and then in a matter of a couple of days, it is all over. It is little surprise then that the Western Australian Branch has been in this 'hangover mode' since May, but activity is about to resume!

The Branch has held a very successful annual Mid-Winter meeting over the years, and the usual thing has been to hold this in a country centre. The last couple of years has seen this held in the south west of the state at the Bunker Bay Resort, which is at the northern end of the Margaret River wine producing region, and once again, the meeting will be held there. However, this year it will be in the spring – Saturday, 29 September 2007. Dr Peter Arrow will speak on the permanent dentition of WA schoolchildren, specifically the incidence and progression of approximal caries and enamel defects; Dr John Camacho will give some practical tips on children's dental care and Dr Tim Johnston will endeavour to answer the question: "Does minimal intervention have a place in paediatric dentistry?" In addition, the usual Pot Pourri will be presented where members will make short presentations of cases of interest, reviews, etc. The only potential problem is that this is Australian Football League Grand Final Day. Some may be temporarily distracted!

Alistair Devlin

Queensland

The Queensland Branch of ANZSPD has met approximately three times since last writing. These occasions have comprised dinner, continuing education and branch meetings.

Dr Andrea Kazoullis, a microbiologist /geneticist with an extensive research background in oral biology at The University of Queensland, stunned the group with her presentation on exploration of differential gene expression pathways. The IQ of Qld ANSZPD has never looked so good.

Professor Newell Johnson spoke to the society about his vision for the Dental School at Griffith University. The presentation generated significant debate, particularly on the desire of Professor Johnson to award MDSc qualifications to Griffith students graduating from the basic (undergraduate equivalent) dental course. The general consensus of attendees was a polite objection to the idea. Notwithstanding that, the group was grateful for Professor Johnson's interesting presentation and reinforced our best wishes for the success of the new school.

Dr Bill Kahler of The University of Queensland, formerly from South Australia, presented a summary of his research on management of root fractures. He provided a very concise review of the subject and outlined the available evidence for the management of root fractures. The presentation was both entertaining and very educational… a great continuing education opportunity for all.

We are currently in the process of finalising our weekend state conference. Speakers include Dr Helen Boocock, who will present on topics such as pain management and treatment of special needs patients. This conference is scheduled for mid to late November, and will be held on the Sunshine Coast. Interstate members are welcome to attend. Families are very welcome at the social functions.

More details can be obtained via email: admin@pdgdental.com.au

Colgate® Corner

by Barbara Shearer
Colgate Professional Relations Manager
barbara_shearer@colpal.com

Lisa Grant

Starley Marshall

We are delighted to announce that two new Territory Managers have joined the Colgate team. Starley Marshall has joined the NSW team and Lisa Grant is based in Auckland. Both Starley and Lisa have experience in dental practices and will be making every effort to meet as many of you as possible, over the coming months.

Oral Health Month

Oral Health Month was bigger and better than ever this August. Our University partners got right behind the goal of improving oral health in the community. At the Colgate Regional Oral Health Centre (University of Newcastle) students volunteered to give free oral health assessments during an Open Saturday morning. At the University of Adelaide, University of Otago, and Auckland University of Technology, staff and students participated in oral health promotion events in shopping centres.

The DHAA also partnered with Colgate to provide volunteers to deliver oral health promotion messages in their local pharmacies.

It was fantastic to have so much support for Oral Health Month from our university and professional partners. The hard work of all those involved is very much appreciated.

Colgate Professional Education Network

The Colgate Professional Education Network was launched at the beginning of 2006 with the objective of offering education modules to dental hygiene, dental therapy, BOH and dentistry students. Dr Sarah Raphael was appointed as co-ordinator of the network and has taken on the training of Colgate Educators across Australia as well as maintaining current modules and adding new titles. At this time we have modules available in Toothpaste, Toothbrushes, Whitening, Mouthrinses, Fluorides and Dentine Hypersensitivity.

Our educators are:

Cathryn Carboon (Dental Hygienist, VIC)

Carolyn Thomson (Dental Hygienist, VIC)

Christina Pedreschi (Dental Hygienist, WA)

Jasmine Bell (Dental Hygienist, SA)

Felicity Dougherty (Dental Hygienist, QLD)

Jenny Morgan (Dental Therapist, NSW)

Rebecca Schipper (Scientific Affairs Mgr, NZ)

Linda Buttle (Dentist/Lecturer, NZ)

We are lucky to have such a great team of educators, with boundless enthusiasm for their roles. This year the team plans to deliver 66 education sessions which is almost 3 times as many as in 2006.

Newcastle Open Day – Oral Health Assessments

AUT Students – Oral Health Promotion in the Community

University of Adelaide Students – Oral Health Promotion in the Community

Colgate Territory Managers are here to assist you with the products you need in your surgeries

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In New Zealand, orders for Colgate products are placed through: Henry Schein Halas/Shalfoon | Phone: 0800 808 855 | Fax: (09) 3781 158

Coming events

23-25 November 2007
ANZSPD Queensland Branch

Weekend Conference
Sunshine Coast
Email admin@pdgdental.com.au

6-10 November 2007
5th International Congress

Developmental Origins of Health and Disease
Perth Convention Exhibition Centre
Perth, WA
http://www.congresswest.com.au/dohad/

22-26 May 2008
61st AAPD Annual Session

Washington DC

29 May – 1 June 2008
9th EAPD Congress

Dubrovnik ,Croatia

16-20 June 2009
22nd IAPD International Congress

International Congress Centre
Munich, Germany

21-25 May 2009
62nd AAPD Annual Session

Honolulu, Hawai

28-31 March 2010
16th Biennial Congress of ANZSPD

Queenstown, New Zealand

27-31 May 2010
63rd AAPD Annual Session

Chicago, III

Austalian and New Zealand Society of Paediatric Dentistry

www.anzspd.org.au

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Submissions

All text for inclusion in Synopses must be submitted to the editor on floppy disk, zip disk, CD, or by email. Both PC and Mac formats are accepted. Media will not be returned. Address email to dorothy.boyd@phsouth.co.nz. Please enclose your contact details and email address with all submissions.

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